FIELD TESTS WITH THIMET ON COTTON INSECT CONTROL IN TAIWAN[1]

by

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Previous experiments conducted in 1959 in Tainan Fiber Crops Experiment Station by Tsai and You[20] showed the effectiveness of systemic insectictde Thimet for the control of leafhopper, aphid and spider mite on cotton seedling stage. The further study of Thimet on control of early season cotton insects, particularly the leafhopper, *Chlerita biguttula Ishida*, and aphid, *Aphis gossypii Glover*, fiield experiments were carried out during 1960 in Tainan Fiber Crops Experiment Station, Taiwan Agricultural Research Institute, Taiwan, Republic of China.

MATERIALS AND METHODS

Experiment 1

The purpose of this experiment was to determine the suitable place of Thimet on furrow treatment. The variety of Empire cotton fuzzy seed was used. One gram of 10% Thimet granules at the rate of two pounds of toxicant per acre was put three different places, i.e., one cm. under the seed, under the seed that contact with seed and 3 cm. aside the seed. The cotton seeds planted by hand on May 16, 1960. The plots were one row wide and five meters length. One line arrangement was replicated four times.

Experiment 2

Furrow treatments were made of 10% Thimet granules at the rate of 1 and 2 pounds of toxicant per acre by hand at the time of planting. The variety of Empire cotton fuzzy seed was planted on June 22, 1960. Side dressing treatment were made of 10% Thimet granules at the rate of 2 and 4 pounds of toxicant per acre by hand after 42 days (Aug. 3) planting under high soil moisture condition. Side dressing trearment was added at the rate of 4 pounds of toxicant per acre by hand after 73 days (Sep. 3) planting on the plot of 1 lb. Thimet furrow treatment for control of mid-and lateseason cotton insects. The plots were nine row wide (9 meters) and eight meters length. A randomized block design was replicated four times.

RESULTS

Experiment 1

The result of this experiment are shown in table 1. The germination of cotton

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was decreased by the treatment of Thimet which place one cm. under the seed or contact with the seed. Plant height of check plots were lower than Thimet treated, because of leaf curl and retarding growth that caused by the attack of leafhopper and aphid. The square count of check plot were less than the Thimet treated plot that was caused by the retarding of plant growth. The population of early-season cotton insects as leafhopper, aphid and spider mite were relatively low during June and July. All Thimet treated plots controled early-season cotton insects effectively. There were no significant difference on insect control effect between three methods of different Thimet places. According to the percentage of insect infestation on square, Thimet has no control effect on the major mid-and late-season cotton insects, i.e., pink bollworm, *Pectinophora gossypiella Saunders* and spotted bollworm, *Earias fabia Stoll.*

Experiment 2

The result of this experiment are shown in table 2. Thimet furrow treatment control leafhopper significantly during 53 days after planting, and aphid during 72 days. Thimet side dressing treated 42 days after planting gave good leafhopper and aphid control effect during 49 days after treatment, and it elongated about 80 days length. High dosages of each treatment showed relatively good control effect. Addition of side dressing treatment on Sep. 3 to the furrow treatment plot, it gave good control effect on leafhopper and aphid, and decreased the population of above two insects on Sep. 10. In this experiment, outbreak of pink bollworm on squares, flowers and bolls were relatlvery lower than spotted bollworm. Thimet has no control effect on pink bollworm and spotted bollworm. The number of squares, flowers and bolls of check plot were less than Thimet treated plot, because of abnormal cotton plant growth that caused by severe leafhopper attacking. The seedcotton yield of side dressing treatment at the rate of 4 pounds Thimet per acre followed by furrow treatment with 1 pound Thimet per acre was highest than other treatment, it was 53 per cent over check.

Table 1. Effectiveness of Thimet furrow treatment with three different place on cotton insects control

Date of examination	Days during planting and examination	Untreated check	Place of one gram 10% Thimet granules		
			3 cm. aside the seed	1 cm. under the seed	under the seed contact with seed
		Percentage of germination			
		63	62	55	43
		Leafhopper infestation (Number per plant)			
June 3	18	1.09	0	0	0
June 14	29	1.73	0.05	0.06	0.13
		Leafhopper infestation (Number per leaf)			
June 18	33	0.90	0.02	0	0
July 1	46	2.23	0.13	0.08	0.23
		Aphid infestation (Number per plant)			
June 3	18	5.78	0.42	0.02	0
June 14	29	0.93	0	0.03	0.03
		Aphid infestation (Number per leaf)			

June 18	33	5.30	0	0	0
July 1	46	0	0	0	0
		Spider mite infestation (Number per plant)			
June 13	18	0.27	0	0	0
June 14	29	0	0	0	0
June 18	33	0	0	0	0
July 1	46	0	0	0	0
		Plant height (cm.)			
July 1	46	21.0	32.0	30.7	31.3
July 23	68	26.3	40.8	42.2	41.1
		Percentage of Pink Bollworm infestation on squares			
July 23	68	6.3	13.7	8.2	10.4
		Percentage of Spotted Bollworm infestation on squares			
July 23	68	11	37	20	21
		Square count (Number per 20 plants)			
July 11	56	84	152	126	166
July 23	68	16	117	110	77

Table 2. Effectiveness of furrow and side dressing treatment with Thimet on cotton insects control

Date of examination	Days during planting and examination	Untreated check	Furrow treatments with Thimet granules*		Side dressing treatment with Thimet granules*	
			1	2	2	4
		Leafhopper infestation (Numbers per 80 leaves)				
July 26	34	344	18	14	361	325
Aug. 7	46	174	36	2	22	30
Aug. 14	53	265	68	34	0	8
Aug. 22	61	451	235	136	12	8
Sep. 2	72	458	300	330	17	2
Sep. 10	80	139	25	156	4	5
Sep. 21	91	473	4	230	50	19
		Aphid infestation (Numbers per 80 leaves)				
Aug. 14	53	3	3	2	2	1
Sep. 2	72	18	4	5	0	0
Sep. 10	80	106	5	59	0	0
Sep. 21	91	182	12	83	31	1
		Percentage of Pink Bollworm infestation on square of fourty plants				
Sep. 13	83	5.03	7.95	12.09	9.84	8.21
Oct. 3	103	23.68	9.55	7.91	8.25	8.70
Oct. 24	124	23.08	2.50	12.96	4.36	3.60
Nov. 9	140	7.69	4.58	6.90	0	0
		Percentage of Pink Bollworm infestation on bloom of fourty plants				
Sep. 13	83	0	3.33	4.00	4.35	3.01
Oct. 3	103	7.32	5.00	3.50	12.00	9.09
Oct. 24	124	2.53	1.96	5.56	1.40	6.78
Nov. 9	140	0	3.70	8.33	0	0
		Percentage of Pink Bollworm infestation on boll of fourty plants				
Sep. 13	83	2.66	0.22	2.22	1.55	0.93
Oct. 3	103	7.94	6.14	3.39	8.78	7.62
Oct, 24	124	4.00	13.69	7.68	8.15	14.81
Nov. 9	140	2.49	3.94	5.14	5.26	4.64
		Percentage of Spotted Bollworm infestation on square of fourty plants				
Sep. 13	83	0	0.66	1.10	0	1.03
Oct. 3	103	11.40	14.65	11.86	13.59	15.19
Oct. 24	124	35.16	18.57	36.11	17.45	20.14
Nov. 9	140	53.85	58.78	65.52	44.44	49.48
		Percentage of Spotted Bollworm infestation on bloom of fourty plants				
Sep. 13	83	0	16·66	0	0	0
Oct. 3	103	4.88	15.00	14.04	6.67	9.09
Oct. 24	124	10.13	13.73	16.67	8.45	13.56
Nov. 9	140	21.43	55.56	25.00	50.00	23.07
		Percentage of Spotted Bollworm infestation on boll of fourty plants				
Sep. 13	83	1.18	0	1.23	1.24	0.93
Oct. 3	103	6.35	7.60	9.92	22.04	15.02
Oct. 24	124	11.20	13.06	12.46	7.07	16.67
Nov. 9	140	39.83	32.78	36.25	30.26	35.54
		Square count (Numbers of fourty plants)				
Sep. 2	72	430	562	394	332	328
Sep. 13	83	139	151	182	244	195

Oct. 3	103	114	314	253	412	540
Oct. 24	124	91	280	108	275	417
Nov. 9	140	26	131	29	81	97
		Bloom count (Numbers of fourty plants)				
Sep. 2	72	30	30	28	22	26
Sep. 13	83	15	30	25	23	33
Oct. 3	103	41	60	57	75	121
Oct. 24	124	79	51	36	71	59
Nov. 9	140	14	27	12	6	13
		Boll count (Numbers of fourty plants)				
Sep. 2	72	100	112	106	120	124
Sep. 13	83	338	456	406	322	324
Oct. 3	103	252	342	383	245	433
Oct. 24**	124	250	314	313	368	378
Oct. 24***	124	208	82	146	123	152
Nov. 9****	140	241	482	331	380	453
		Seedcotton yield (kilograms per hectare)				
Seedcotton yield		580.5	886.4	795.8	725·0	811.3
Index		100	153	137	125	140
Gain over check		—	305.9	215.3	145.0	230.8

L. S. D. 5%=3.26
1%=5.41

* All dosages in actual pounds per acre
** Unmature boll
*** Dry harvested boll
**** Numbers of bolls except dry harvested boll

DISCUSSION AND CONCLUSION

Thimet was used on cotton insect control firstly by Ivy, Scales and Gorizychi [11] at Texas in 1954. Reports about practical application of Thimet were written by many workers on various crops. Thimet gave effective control on; thrips[1,7,11,15,16,17,19,20], aphid[1,6,9,10,11,15,16,17,19,20], spider mite[11,15,20] and overwintered boll weevil[11,15,16,17] of cotton.

In Taiwan, most severe early-season cotton insects are leafhopper and aphid. According the results of these experiment, Thimet applied at the dosages of 1 and 2 pounds per acre as a furrow treatment significantly decreased the number of leafhopper for 53 days, and aphid for 72 days. Thimet applied at 2 and 4 pounds per acre as a side dressing treatment after 42 days planting decreased the population of leafhopper and aphid for 49 days and as long as 80 days after treatment. Hopkins, Fye and Walker[10] reported that Thimet applied at 10, 20 and 30 pounds per acre as a side dressig significantly decreased the numbers of cotton aphid for 15 months, and seed or further treatments with 1 to 3 pounds per acre at time of planting significantly reduced aphid populations for one growing season. Adkinsson[1] and Hopkins, Fye and Walker[9] reported that Thimet gave aphid control until late in the season. Most severe insects in the mid- or late-season cotton in Taiwan are pink bollworm, spotted bollworm and bollworm (*Heliothis armigera*). Thimet has no control effect for pink bollworm and spotted bollworm according to the result of these experiments. Bollworm was not discovered on these experiments. Thimet had no effective control for bollworm[11] or increase bollworm infestation(15). Because of relatively low population of insects in the cotton seedling stage in Taiwan, the side dressing at the time of first fertillization 3 to 6 weeks after the date of planting may more economical than seed treatment or furrow treatment and increase the period of plant pretection. It is considerable that Thimet may be use for early or mid-season cotton insect control in

Taiwan, and can save 2 to 3 times of chemical spray for leafhopper and aphid control. But in the area that pink bollworm or spotted bollwerm is the problem of early- or mid- season cotton growing, for using of Thimet is hopeless.

When Thimet granular are placed contact with cotton seed or one cm. under the seed, it decreased the percentage of cotton germination, but there were no significant negative growth of delayed fruiting of cotton. Thimet may delayed fruiting of cotton[4,15] and adverse effects upon the germination[15] and negatable growth of cotton[4,15]. Seed treatments of Thimet adversely affected stands, but in furrow treatment did not[9]. Parencia, Davis and Cowan[18] noted that under dry and cool or better moisture condition, Thimet had no influence to germination and stand. Reynolds etc.[19] reported that many cotyledons of newly emerged ctton, alfalfa and sugar beet plants showed some burns on the outer margins with Thimet treatment. It was more pronounced at the higher rates, but did not appear in the leaves. Seedling cotton plants show some reduction in size but this difference disappeares in about 2 to 3 weeks. Tsai and You[20] described that Thimet treated cotton seed produce small size of cotyledon. High Thimet dosages may cause necrotic flecking of the leaves [5,11].

Thimet-fertilizer mixtures did not cause any apparent phytotoxicity to the three grain crops[12]. Various soil phosphate level had no measurable effect on the uptake of the texicant[10], It was no evidence that Thimet was taken up or tranaslocated more readily in soils with a lower level of phosphorus[9]. Thimet may absorbed very quickly from soil under high soil moisture condition. It decreased the population of leafhopper and aphid significanlly 4 days after side dressing in our experiment (Exp. 2).

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SUMMARY

These experiments were carried out during 1960 in Tainan Fiber Crops Experiment Station, Taiwan Agricultural Research Institute, Taiwan, Republic of China. Ten per cent Thimet granules was applied by in-furrow at the rate of 1 (A treatment) and 2 (B treatment) of toxicant per acre and side dressing at the rate of 2 (C treatment) and 4 pounds (D treatment) of toxicant per acre after 42 days planting. Side dressing treatment was added at the rate of 4 pounds of toxicant per acre after 73 days planting on the plot of A treatment.

Thimet furrow treatment controled leafhopper significanlly during 53 days and aphid during 72 days. Thiment side dressing treatment gave good leafhopper and aphid control during 49 days and it elongated about 80 days length. Thimet treatment gave no control effect on pink bollworm and spotted bollworm.

The range ef yield was A>D>B>C>CK, its yield per hectare were 886.4, 811.3, 795.8, 725.0 and 580.5 kg. resp., and its index were 153, 140, 137, 125 and 100 resp.

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棉作害蟲防治 Thimet 田間試驗

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摘　　要

本試驗于1960年間，於臺南棉麻試驗分所農場舉行。使用10% Thimet 粒劑，計分4種處理。即在播種棉籽時，于棉籽旁每英畝使用 Thimet（以 Technical 計算）1磅(A處理)及2磅（B處理)，另於播種棉籽後42天于棉株旁每英畝條施 Thimet 2磅(C處理)及4磅(D處理)。A處理在播種後73天，另條施每英畝 Thimet 4磅。

A及B處理，經施用 Thimet 後53天，對棉浮塵子防治有顯著之效果，對棉蚜蟲防治則有72天之效果。C及D處理，對棉浮塵子及棉蚜蟲之防治有效期間，有49～80天之久。對主要棉鈴害蟲，大紅鈴蟲及綠帶金鋼鑽，各處理均無防治效果。各處理之籽棉產量高低順序爲 A>D>B>C> 對照區(CK)，其產量每公頃爲 886.4, 811.3, 795.8, 725.0 及 580.5 公斤，產量指數各爲 153: 140: 137: 125: 100。

將1公分量之10% Thimet 粒劑置於棉籽下部1公分處，或與棉籽接觸時，顯著的減少棉籽發芽率。如置於棉籽旁邊3公分處，則無任何葯害現象。